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"ON SOME ASPECTS OF ROUGH SETS AND ITS APPLICATIONS"

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Introduction:

Rough set (RS) can be regarded as a new mathematical tool for Imperfect knowledge or vagueness. The problem of imperfect knowledge has been tackled for a long time by philosophers, logicians and mathematicians. Recently it has become also a crucial issue for computer scientists and mathematicians particularly in the area of lattice theory, algebra, neural network, Artificial Intelligence etc. There are many approaches to the problem of how to understand and manipulate imperfect knowledge.

RS theory is not alternative to classical set theory or fuzzy set theory. Its philosophy is an assumption that with every object of universe of discourse is associated with some information. Objects characterized by some information are indiscernible (similar) in view of available information about them.

When the available information is insufficient to determine the exact value of a given set, lower and upper approximations can be used by rough set for the representation of the concerned set. The approximation synthesis of concepts from the acquired data is the main objective of the rough set analysis. For example, if it is difficult to define a concept in a given knowledge base, rough sets can 'approximate' with respect to that knowledge. In decision making, it has confirmed that rough set methods have a powerful essence in dealing with uncertainties.

The RST has been applied in several fields including image processing, data mining, pattern recognition, medical informatics, knowledge discovery and expert systems. In the current literature, several research works have been combined the rough set theory with other artificial intelligence methods such as neural networks, fuzzy logic. The use of rough set theory to solve a specific complex problem has attracted world-wide attention of further research and development, extending the original theory and increasingly widening fields of application.

Purpose of carrying out Proposed research work:

- ✓ It does not need any preliminary or additional information about data like probability in statistics, grade of membership in the fuzzy set theory.
- ✓ It provides efficient methods, algorithms and tools for finding hidden patterns in data.
- ✓ It allows reducing original data, i.e. to find minimal sets of data with the same knowledge as in the original data.
- ✓ It allows evaluating the significance of data.
- ✓ It is easy to understand.
- ✓ It offers straightforward interpretation of obtained results.
- ✓ It is suited for concurrent (parallel/distributed) processing.
- ✓ It is easy internet access to the rich literature about the rough set theory, its Extension as well as interesting applications.

Review of Literature and development in the Relevant subject :

RS theory has attracted worldwide attention of many researchers and practitioners who have contributed essentially to its development and applications.

The first pioneering paper on rough sets written by Zdzisław Pawlak was published by International Journal of Computer and Information Sciences in 1982.

In 4 dec 2005, non-profit organization dedicated to scholarship in rough set, *"The International Rough Set Society"* was established to promote study and exchange of ideas related with RS foundations, methods, as well as their extensions and applications.

From 1982 to 1990, many reports and theses on rough sets were actively published by the Warsaw Research Group at the Polish Academy of Sciences and Warsaw University of Technology.

In September 1992, there was the first international workshop on rough sets in Poznan, Poland, together with conference proceedings has been organized .The selected papers from this conference were published in Intelligent Decision Support--Handbook of Applications and Advances of the Rough Sets Theory by Kluwer Academic Publishers in 1992. Most of the rough set related papers written in English before 1990 are listed in the annotated bibliography of the first book on rough sets.

Since, the early-1990's, many people have been very active in organizing workshops and publishing conference proceedings on rough sets

The distribution of the proceedings of these workshops is limited to mostly the workshop participants. The first International Conference on Rough Sets and Current Trends in Computing was held in 1998 at Warsaw,Poland .Since then, this series of conferences have been held every two years at different locations in the Europe and the North America: 1998, Warsaw, Poland; 2000, Banff, Canada; 2002, Malvern, the USA; 2004, Uppsala, Sweden. The selected papers from these conferences and other articles have been published by Springer-Verlag as the series of Lecture Notes in Artificial Intelligence.

In October 2003, another series of international conferences was initiated. This series is a continuation of international workshops devoted to the subject of rough sets, held in Canada, China, Japan, Poland, Sweden and the USA. It achieved a status of bi-annual international conference, starting from the year of 2003, in Chongqing, China. The conference encompasses rough sets, fuzzy sets, granular computing as well as knowledge discovery and data mining. The second conference of this series was held in Regina, Canada, in September 2005; the third was planned in Japan in 2007. The proceedings of the first conference are available from the Springer-Verlag in Berlin, Germany.

In April 2004, the first volume of a new LNCS journal subline. "*Transactions on Rough Sets"* published by Springer-Verlag was appeared. The journal includes high-quality research articles, dissertations, monographs and extended and revised versions of selected papers from conferences. A good source of information about the most recent rough set literature mostly with short abstracts provides the Rough Set Database System .This database contains over 1700 entries published from 1982 to 2004. Since 1996 the International Rough Set Society publishes own bulletin including important and current information for the rough set community.
Most rough set research groups have their own software packages and tools to assist the analysis, and/or simulation of various applications.

- ✓ **Importance of Study:**

International status:-

- Various works shops and conferences organized in different countries like The USA, Canada.
- In China, the rough set theory has been developed rapidly, and academic activities are also very active.
- An International Rough set society was formed in Poland.
- Special Journals for RS theory was published.
- Alicja Mieszkowicz-Rolka and Leszek Rolka, Rzesz´ow, Poland, studied system properties of RS
- At international level , Mert Bal from Turkey, Kevin E. Voges from New Zealand, Thabet Slimani from Taif University, Silvia Rissino and Germano Lambert-Torres from Brazil and so on working on RS theory and its applications.
- A pair of dual rough set operations on Boolean algebra was defined by Liu
- Biswas and Nanda published a paper on rough group in 1994 in which the notion of rough subgroup was introduced.
- Kuroki and Mordeson studied the structure of rough sets and rough groups.

National status:-

- In year 2009, International conferences organized related to Rough set in Tripura university,Agartala, Women's Christian College, Chennai.
- Banerjee M and Chakraborty M.K, Khan M.A and others from dept.of mathematics, IIT Kanpur are working on RS theory.
- NEELIMAC.A, Form Kerla, published research on application of RS theory in Rings.
- Dr. Sonajaharia Minz, Professor, School of Computers and Systems Sciences, Jawaharlal Nehru University, New Delhi, conducted a workshop which brought out the basic concepts of Rough Set Theory and Granular Computing with examples and hands on exercise.

Regional status:-

- In Maharashtra, RS theory is used in computer sci. and engineering field. as
  - ✓ In North maharashtra University, Manoj Patil and Kolhe, published article of RS in image processing.
  - ✓ In Amaravati University, Suruchi V. Nandgaonkar, Prof.A.B.Raut, study parallel method for Rough set in data mining.
  - ✓ Kanchan tiwari and Kothari published article related application of RS in engineering field.

✓ Objectives of Research /Proposed Hypothesis:

The main objectives of this study are:

- To study the existing RS applications.
- To study logical aspects of RS.
- To study algebraic Aspect of RS.
- To study topological aspects of RS.
- To define various algebraic structures related Rough sets.
- To make generalization of some applications in RS theory.

✓ Hypothesis-

- Rough set theory has close connections with many other theories. Some of them, like lattice, topology.
- Algebraic structures of rough sets in different approximation spaces.
- Logical aspects of RS in Boolean algebra.
- Previous Applications of RS.

- ✓ **Research Methodology:**

  - Collection of relevant research papers, review articles, books, journals etc. through internet and by visiting various libraries.
  - To participate in the relevant fields like conferences, workshops, seminars.
  - To obtain an alternative solution of the problems by applying new technique and compare the results with the results already obtained.

Proposed Work Plan/Formulation & Structure of Study: (Year-Wise plan of work and targets to be achieved) :

First year

- To collect the references in relevant field.
- To study the references in relevant field.
- To attend the seminars/Conferences/Workshops on relevant topic.
- To collect the materials related RS theory.

Second year

- To formulate new RS models for different application.
- To study existing techniques which are applied in this theory.
- To analyze applications of RS theory in Algebra, Integral equations, etc.
- To find new aspects of RS theory.

Third year

- To explore new relationship in RS theory.
- To publish the quality works in the reputed journals.
- To study applications of obtained results.
- To publish the research works in the reputed journals.
- To submit the quality research work to the authority.

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